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# PATENT COOPERATION TREATY

## PCT

REC'D 26 APR 2001

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### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P9402PC00		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/DK00/00013	International filing date (day/month/year) 14/01/2000	Priority date (day/month/year) 15/01/1999	
International Patent Classification (IPC) or national classification and IPC G01N21/00			
Applicant FUNKI MANURA A/S et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 09/08/2000	Date of completion of this report 24.04.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer de Cauwer, R Telephone No. +49 89 2399 7344 

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/DK00/00013

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

### Description, pages:

1-13,15-19	as originally filed	
14	with telefax of	11/04/2001

### Claims, No.:

1-8	with telefax of	20/02/2001
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### Drawings, sheets:

3/6-6/6	as originally filed	
1/6,2/6	with telefax of	11/04/2001

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

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4. The amendments have resulted in the cancellation of:

- ☐ the description,      pages:
- ☐ the claims,      Nos.:
- ☐ the drawings,      sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes:	Claims	3, 5-7
	No:	Claims	1, 2, 4 and 8
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1 - 8
Industrial applicability (IA)	Yes:	Claims	1-8
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/DK00/00013

**Re Item V**

**Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following document:

D1: WO 98 22394 A1 (ENVOTECH A/S) 28 May 1998, corresponding to patent application DK 01288/96, cited in the description

D1 discloses a process for cleaning manure (page 3, line 11), containing more and less volatile compounds present as weak acids and bases (page 6, line 4-10), by evaporation comprising the steps of heating the wastewater in a boiler (4), cleaning the generated steam from unwanted gaseous compounds by taking the steam from the boiling step via a compression step (3) to a heat exchanging step (2), where the water is condensed (claim 1, line 4-7 and fig 2). In the process of D1 the steam from the boiler is conducted to a column (1) (fig 2 and claim 1, line 9-10), where the steam is flowing countercurrently to a fraction of the condensed water (figure 1, 2 and 3), and where the more volatile components in the form of vapour are conducted via a compressor (3) (figure 2 and page 8, line 29) to a heat exchanger (2) where they are partly condensed (page 5, line 4-10) and discharged (claim 1, line 11-13), the less volatile components are conducted to the vessel in the bottom of the column and subsequently discharged at intervals (page 8, line 10-11 and page 10, line 8-11), and the condensed and cleaned water is drained off.

Thus, the **claimed** subject-matter of claims 1, 2, 4 and 8 is not differentiated over that of D1 and thus, does not meet the requirements of Article 33 (2) PCT.

Dependent claims 3, 5 - 7 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step (Article 33 (3) PCT).

which gives the steam an increase pressure, whereby the condensation temperature of the steam increases to such a degree that the steam is able to condense, when it flows over to the heat exchanger 50.

5 The condensate from the steam runs down to the bottom of the heat exchanger 50, in which it is collected until a certain level is achieved, which is determined by the float switch 66, which by activation opens valve 67 which permits the condensate to flow to the vessel 68. The level of liquid in boiler 42 is kept constant by means of valve 70, which opens by activation through the float switch 69 which permits that the liquid  
10 which is to evaporate flows through said valve 70, a first heat exchanger 71 (in which the polluted liquid heat exchanges with the condensate), a second preheat exchanger 72 (in which the polluted liquid is heat exchanging with the steam) and is mixed with the liquid from the boiler 42, which is under evaporation and thereafter introduced into the downdraught evaporation heat exchanger 50.

15 In the condensate vessel 68 a reservoir of condensate is collected until the level which is determined by the level sensor 73 is achieved, which permits that the valve 74 opens and 75-95% of the condensate (abbreviated  $C_d$ ) leaves the apparatus through the first preheat exchanger 71, which is the heat exchanger which receives the incoming aqueous liquid W.  
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A part of the condensate (5%-25%) is pumped by means of pump 75 to the top of the absorption column 62, in which it is distributed to the column elements within the column. On its way down to the absorption column 62 the condensate absorbs the impurities from the steam, which rises up from the boiler 42 and acid/base reactions are  
25 taking place. In the legend to Fig. 4 these reactions are further explained.

The condensate containing the impurities is led from the bottom of the absorption column 62 to the process vessel 41, in which it is mixed with the liquid which is under evaporation and cleaning. The part of the steam containing the more mobile compounds is led from the column 62 via the compressor 49 to the heat exchanger 50. The  
30 part hereof, which by passing through the heat ex-

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## CLAIMS

1. Process for cleaning of biological waste water which contains more mobile compounds and less mobile compounds compared to the mobility of water, said compounds being present as weak acids and weak bases, by evaporation of the waste water, by heating the waste water in a boiler (4,42), where the generated steam is cleaned for unwanted gaseous compounds, where the steam is taken from the boiling step via a compression step to a heat exchanging step, where the water is condensed, characterised in that the steam from the boiler (4,42) is conducted to a column (1,62), in which the steam is flowing countercurrently to a fraction of the condensed water in order to in a liquid form to remove the less mobile compounds including a part of the more mobile compounds and the less mobile compounds which are taking part in the acid/base reactions, in that the steam fraction containing a remaining part of the more mobile compounds are led from the column (1,62) via the compression step to the heat exchanging step, where the main part of the more mobile compounds are concentrated and drained off together with a remaining fraction of the steam, and in that the condensed and cleaned waste water is drained off to recipient.
2. Process according to claim 1, characterised in that the waste water is manure, which contains compounds, which comprise  $\text{CO}_2$ ,  $\text{NH}_3$ ,  $\text{NH}_4^+$ , fatty acids including  $\text{CH}_3\text{COOH}$ , where the less mobile compounds and the more mobile compounds are able to take part in acid/base reactions, and in that a part of the condensate from the heat exchanger is led countercurrently to the steam, which is conducted to the column from the boiler.
3. Process according to claim 1 or 2, characterised in that the steam which has left the column is condensed in a heat exchanger with its own condensate as counter-current flow.

## REPLACEMENT SHEET

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4. Process according to any of the preceding claims, characterised in that acid/base reactions in the column are taking place upon the surface of the column elements.

5. Process according to any of the preceding claims, characterised in that the remaining fraction of the condensed water which is led to the column constitutes 5-25% of the total condensate.

6. Process according to any of the preceding claims, characterised in that the compounds which in liquid form are led from the column and back to the boiler are emptied herefrom when the concentration has achieved a predetermined level.

7. Process according to any of the preceding claims, characterised in that the heat exchanging step is carried out in a downdraught evaporation heat exchanger, where the gas fraction flows countercurrently with its own condensate.

8. Apparatus for use in the process according to any of the preceding claims and which comprises a boiler (4,42), a column (1,62), a compressor (3,49), and a heat exchanger (2,50), where the compressor (3,49) is placed between the column (1,62) and heat exchanger (2,50), and where a pump (5,43) is placed between the boiler (4,42) and heat exchanger (2,50) for tranference of the content of the boiler (4,42) to the heat exchanger (2,50) for heat exchanging of the steam from the column (1,62) and characterised in that the column (1,62) is connected with a steam tapping (47) from the boiler (4,42).

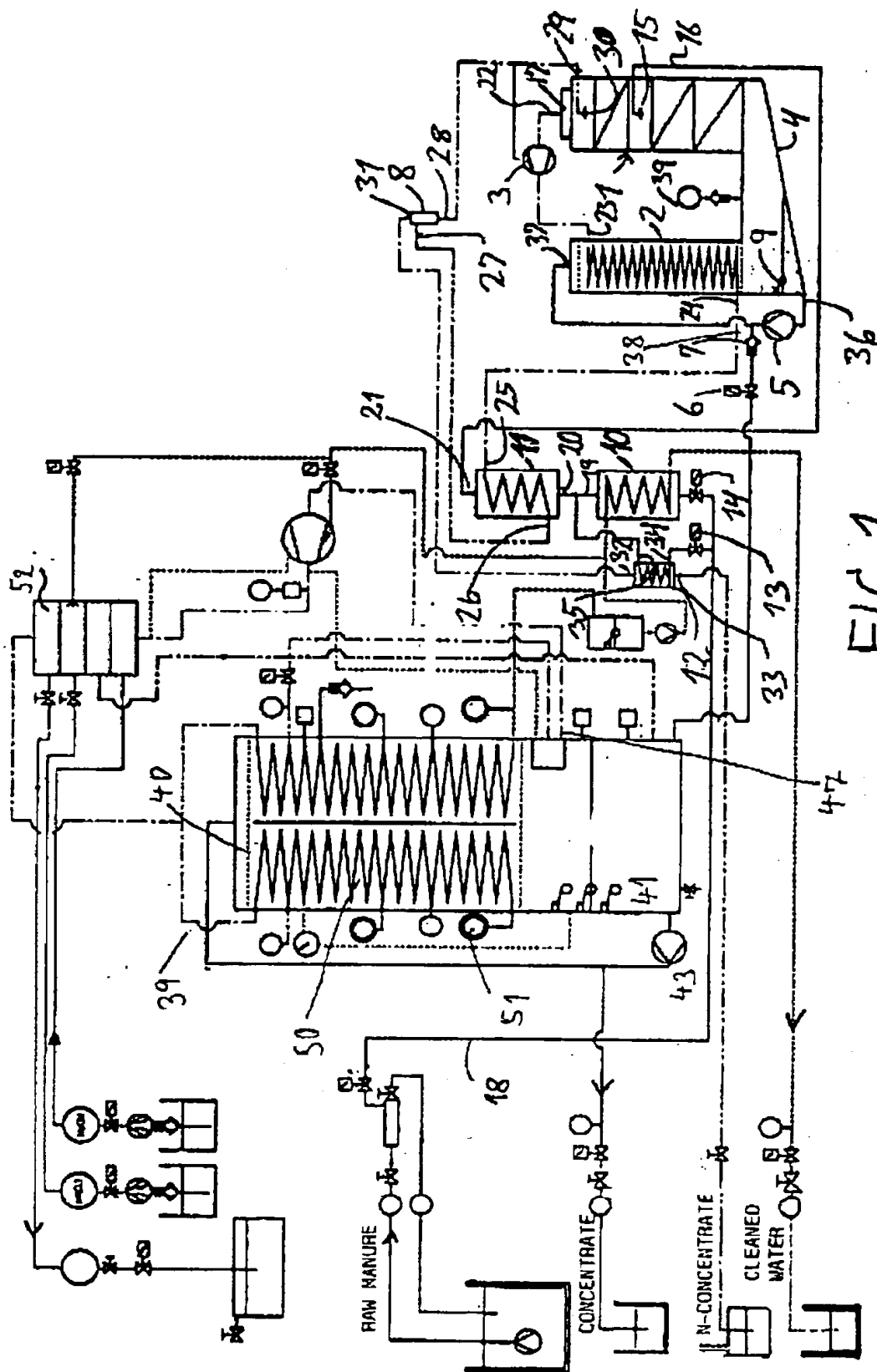


FIG. 1



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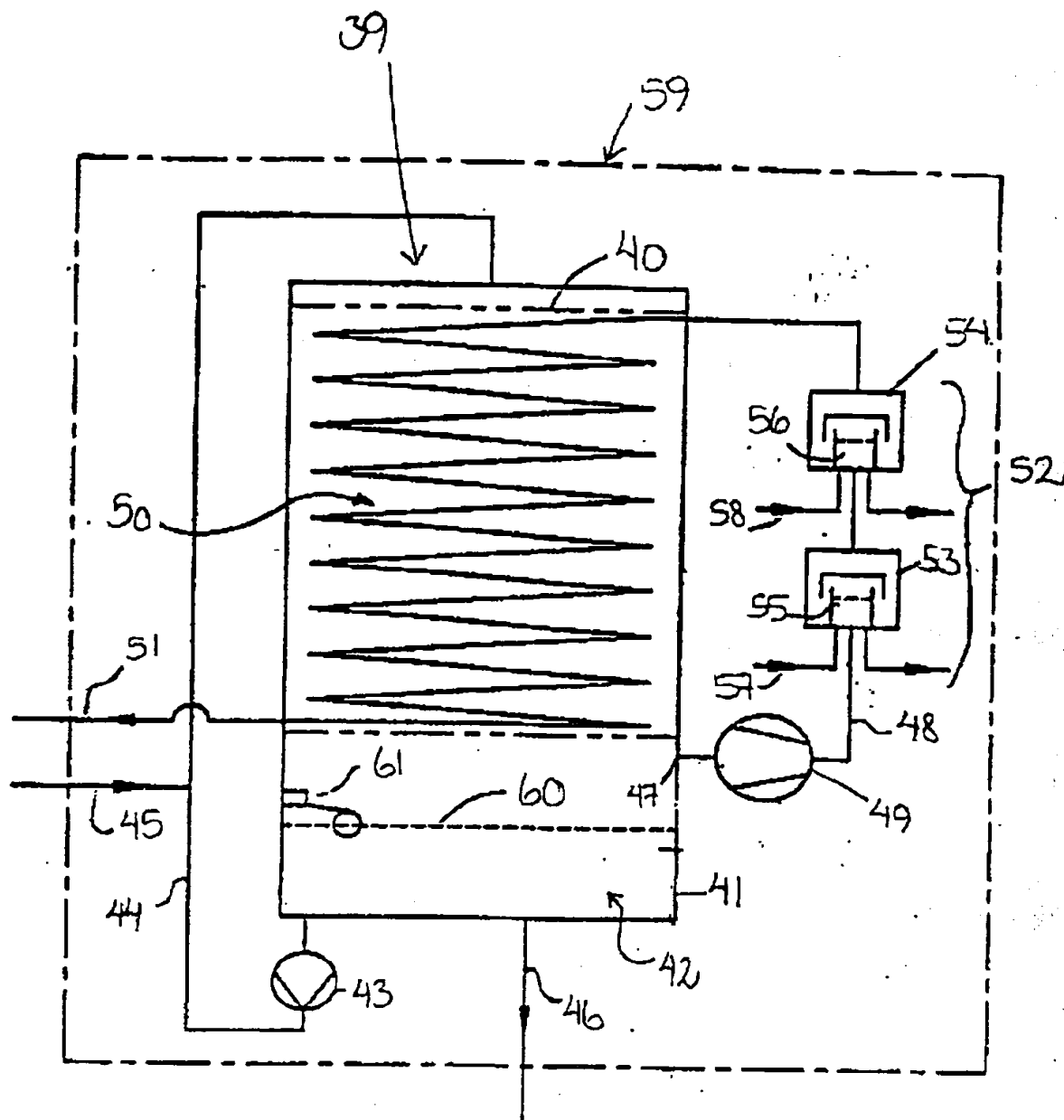


Fig. 2

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P9402PC00	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No PCT/DK 00/ 00013	International filing date (day/month/year) 14/01/2000	(Earliest) Priority Date (day/month/year) 15/01/1999
Applicant  FUNKI MANURA A/S et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

PROCESS AND APPARATUS FOR CLEANING OF WASTE WATER BY EVAPORATION

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38 2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

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☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 00/00013

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: C02F 1/04 // B01D 1/00, F25J 3/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: C02F, B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9822394 A1 (ENVOTECH A/S), 28 May 1998 (28.05.98), page 7, line 29 - page 10, line 14, figure 1, claim 1, abstract --	1-8
A	US 4304638 A (VERITY C. SMITH), 8 December 1981 (08.12.81), column 3, line 6 - column 4, line 16, figure 1, claim 1, abstract --	1,8
A	US 4246417 A (UTAH TSAO), 20 January 1981 (20.01.81), figure 1, abstract --	1-8

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"B" earlier document but published on or after the international filing date

"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

18 May 2000

Date of mailing of the international search report

06 July 2000 (06.07.00)

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 00/00013

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9710884 A1 (ENVOTECH A/S), 27 March 1997 (27.03.97), figure 1, abstract  -----	1-8

## INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/DK 00/00013

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9822394	A1	28/05/98	AU	4940997 A	10/06/98
				EP	0956268 A	17/11/99
US	4304638	A	08/12/81	CA	1164398 A	27/03/84
				GB	2057279 A,B	01/04/81
				US	4248672 A	03/02/81
US	4246417	A	20/01/81	DE	2918979 A,C	22/11/79
				GB	2021425 A,B	05/12/79
WO	9710884	A1	27/03/97	AU	7083496 A	09/04/97
				DK	105795 A	24/02/97
				DK	171611 B	24/02/97
				EP	0859654 A	26/08/98